PB-251 118

TYGART RESERVOIR, BARBOUR AND TAYLOR COUNTIES, WEST VIRGINIA

National Environmental Research Center

Prepared for:

Pacific Northwest Research Laboratory

June 1975

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U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL EUTROPHICATION SURVEY

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REPORT
ON
TYGART RESERVOIR
BARBOUR AND TAYLOR COUNTIES
WEST VIRGINIA
EPA REGION III
WORKING PAPER No. 470

WITH THE COOPERATION OF THE
WEST VIRGINIA DEPARTMENT OF NATURAL RESOURCES
AND THE
WEST VIRGINIA NATIONAL GUARD

JUNE, 1975

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

1. REPORT NO.	3. RECIPIENT'S ACCESSION NO.
4. TITLE AND SUBTITLE Report on Tygart Reservoir, Barbour and Taylor Counties.	5. REPORT DATE Prepared June 1975 6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S) Anonymous (National Eutrophication Survey Staff)	8. PERFORMING ORGANIZATION REPORT NO. Working Paper No. 470
9. PERFORMING ORGANIZATION NAME AND ADDRESS National Eutrophication Survey U.S. Environmental Protection Agency P.O. Box 15027 Las Vegas, NV 89114	10. PROGRAM ELEMENT NO. 11. CONTRACT/GRANT NO.
12. SPONSORING AGENCY NAME AND ADDRESS Office of Research and Development U.S. Environmental Protection Agency 401 M Street, S. W. Washington, DC 20460	13. TYPE OF REPORT AND PERIOD COVERED Final - 1973 14. SPONSORING AGENCY CODE

15. SUPPLEMENTARY NOTES

Prepared in cooperation with the U.S. Environmental Protection Agency, Corvallis Environmental Research Laboratory, Eutrophication Survey Branch, Corvallis, OR 97330

16. ABSTRACT

Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivided according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

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17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN-ENDED TERMS	c. COSATI Field/Group
eutrophication lakes nutrients phosphorus nitrogen loading		05B 05C

18. DISTRIBUTION STATEMENT Release unlimited	19. SECURITY CLASS (This Report)	21. NO. OF PAGES 155
	20. SECURITY CLASS (This Page)	22. PRICE 9.50

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FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to fresh water lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point-source discharge reduction and non-point source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's fresh water lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by EPA and to augment plans implementation by the states.

ACKNOWLEDGMENT

The staff of the National Eutrophication Survey (Office of Research & Development, U. S. Environmental Protection Agency) expresses sincere appreciation to the West Virginia Department of Natural Resources for professional involvement and to the West Virginia National Guard for conducting the tributary sampling phase of the Survey.

Ira S. Latimer, Jr., Director of the Department of Natural Resources; and John H. Hall, Chief of the Water Resources Division; and the Water Resources Division staff provided invaluable lake documentation and counsel during the Survey, reviewed the preliminary reports, and provided critiques most useful in the preparation of this Working Paper series.

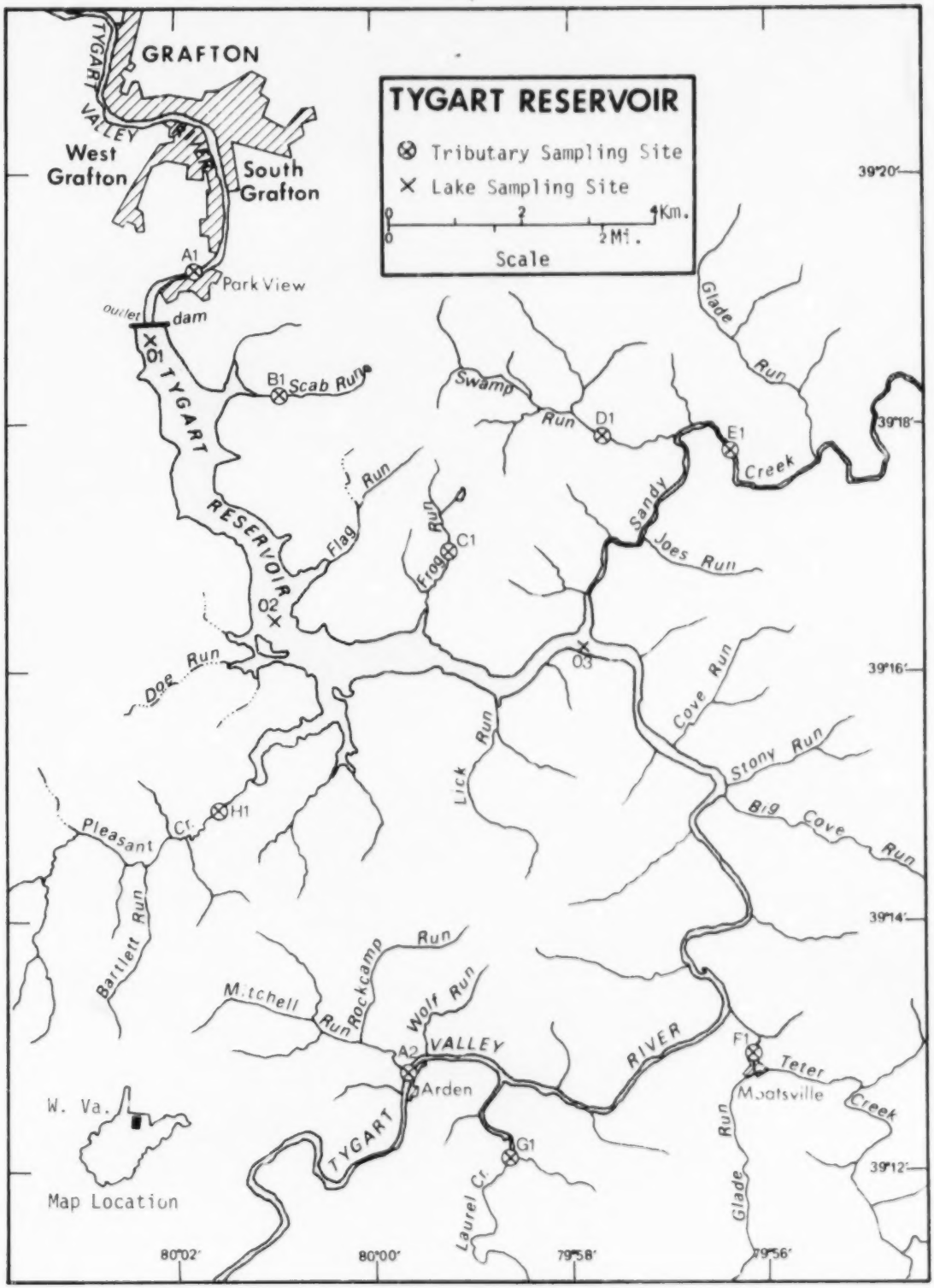
Major General Jack W. Blair, the Adjutant General of West Virginia, and Project Officer Major Manuel G. Goble, who directed the volunteer efforts of the West Virginia National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

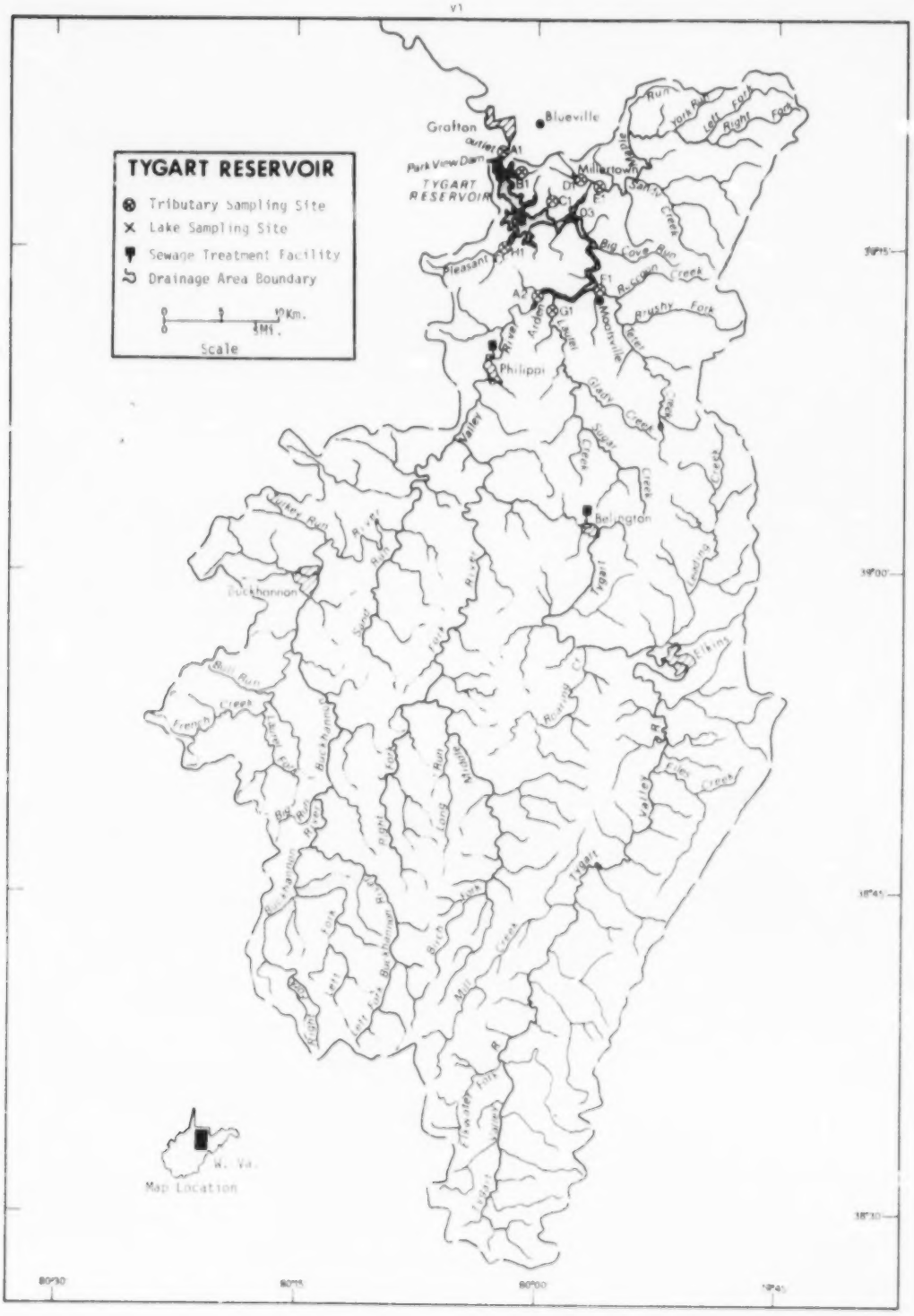
NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF WEST VIRGINIA

LAKE NAME	COUNTY
Bluestone	Mercer, Monroe, Summers, WV; Giles, VA
Lynn	Monongalia
Summersville	Nicholas
Tygart	Barbour, Taylor


TYGART RESERVOIR
Tributary Sampling Site
Lake Sampling Site
0 2 4 Km.
0 2 Mi.
Scale
GRAFTON
TYGART VALLEY RIVER
West Grafton
South Grafton
A1
Park View
outlet
dam
X01
TYGART RESERVOIR
B1
Scab Run
Swamp Run
D1
Glade Run
E1
Creek
Sandy
Joes Run
Flag Run
Frog Run
C1
O2
O3
Doe Run
Lick Run
Cove Run
Stony Run
Big Cove Run
Pleasant Cr.
H1
Bartlett Run
Mitchell Run
Rockcamp Run
Wolf Run
A2
VALLEY
RIVER
F1
Teter Creek
Moatsville
Arden
TYGART
G1
Laurel Cr.
Glade Run
W. Va.
Map Location
39°20'
39°18'
39°16'
39°14'
39°12'
80°02'
80°00'
79°58'
79°56'


TYGART RESERVOIR
Tributary Sampling Site
Lake Sampling Site
Sewage Treatment Facility
Drainage Area Boundary
0 5 10 Km.
0 5 MI.
Scale
Grafton
Blueville
Park View Dam
TYGART RESERVOIR
Millertown
Philippi
Belington
Buckhannon
R. Va.
Map Location
80°30
80°15
80°00
39°15
39°00
38°45
38°30

TYGART RESERVOIR

STORET NO. 5404

I. CONCLUSIONS

A. Trophic Condition:

Survey data indicate that Tygart Reservoir is mesotrophic. It ranked first in overall trophic condition when the four West Virginia lakes sampled in 1973 were compared using a combination of six parameters*. None of the other lakes had less but one had the same median total phosphorus, one had less median dissolved phosphorus, none had less median inorganic nitrogen or mean chlorophyll a, and one had greater mean Secchi disc transparency. Marked depression of dissolved oxygen with depth occurred at all three sampling stations in July and at station 1 in October.

Much of the Tygart Valley River drainage downstream from the confluence of Roaring Creek (about ten kilometers west of Elkins; see map, page vi) is impacted by acid mine wastes (Hall, 1975). The effect of these wastes on the trophic condition of Tygart Reservoir was not determined although evidenced by the rather low pH of the reservoir water. It is reported that a continuing supply of acid substances to certain lakes in Sweden causes oligotrophication of those waters (Grahn et al., 1974); conversely, some mid-Missouri strip mine lakes are reported to have become early eutrophic as the acid production of the stripped areas gradually diminished (King et al., 1974). The

* See Appendix A.

question of controllability of acid mine wastes was not addressed during the Survey.

B. Rate-Limiting Nutrient:

The algal assay results and the high ratios of inorganic nitrogen to orthophosphorus measured in the reservoir indicate phosphorus was the limiting nutrient at all sampling times.

C. Nutrient Controllability:

1. Point sources--During the sampling year, the estimated phosphorus contribution of point sources amounted to 11.1% of the total load. The Philippi sewage treatment plant accounted for an estimated 7.5% of the total, and the Belington plant contributed an estimated 3.5%.

The reservoir received a total phosphorus loading of 6.79 $g/m^2/yr$ during the sampling year. This loading is twice that proposed by Vollenweider (Vollenweider and Dillon, 1974) as a eutrophic loading (see page 14).

Now, Vollenweider's model probably does not apply to water bodies with short hydraulic retention times, and the mean hydraulic retention time of the reservoir is a relatively short 20 days. However, regardless of the applicability of the model, Tygart Reservoir is phosphorus limited, and all phosphorus inputs should be reduced to the greatest practicable degree to protect the existing water quality.

2. Non-point sources--Non-point sources contributed about 89% of the total phosphorus load during the year of sampling. The Tygart Valley River contributed 55.3% of the load, and 11.5%

of the load was contributed by the remaining seven sampled tributaries. Unsampled tributaries and immediate drainage accounted for an estimated 21.8% of the load.

The phosphorus export rate of Scab Run was over six times the mean of the export rates of the other Tygart Reservoir tributaries (see page 13). The high export rate resulted from exceptionally high phosphorus concentrations in the stream in July, August, and September of 1973 (see Appendix E). The cause of these high phosphorus levels is not known but may have been due to recreational use of the area.

II. LAKE AND DRAINAGE BASIN CHARACTERISTICS†

A. Lake Morphometry††:

1. Surface area: 7.08 kilometers^2.
2. Mean depth: 17.4 meters.
3. Maximum depth: 53.9 meters.
4. Volume: 123.192 x 10^6 m^3.
5. Mean hydraulic retention time: 20 days (based on outlet flow).

B. Tributary and Outlet:
(See Appendix C for flow data)

1. Tributaries -

Name	Drainage area (km^2)*	Mean flow (m^3/sec)*
Tygart Valley River	2,447.5	50.1
Scab Run	4.3	0.1
Frog Run	3.4	0.1
Swamp Run	9.7	0.2
Sandy Creek	207.2	4.5
Teter Creek	138.6	3.1
Laurel Creek	140.1	3.1
Pleasant Creek	32.6	0.7
Minor tributaries & immediate drainage -	547.4	11.3
Totals	3,530.8	73.2

2. Outlet -

Tygart Valley River	3,537.9**	72.7

C. Precipitation***:

1. Year of sampling: 135.3 centimeters.
2. Mean annual: 105.4 centimeters.

† Table of metric conversions--Appendix B.
†† Robinson, 1974.
* For limits of accuracy, see Working Paper No. 175, "...Survey Methods, 1973-1976".
** Includes area of lake.
*** See Working Paper No. 175.

III. LAKE WATER QUALITY SUMMARY

Tygart Reservoir was sampled three times during the open-water season of 1973 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from three stations on the reservoir and from a number of depths at each station (see map, page v). During each visit, a single depth-integrated (4.6 m to surface) sample was composited from the stations for phytoplankton identification and enumeration; and during the April visit, a single 18.9-liter depth-integrated sample was composited for algal assays. Also each time, a depth-integrated sample was collected from each of the stations for chlorophyll a analysis. The maximum depths sampled were 38.1 meters at station 1, 28.0 meters at station 2, and 22.9 meters at station 3.

The sampling results are presented in full in Appendix D and are summarized in the following table.

A. SUMMARY OF PHYSICAL AND CHEMICAL CHARACTERISTICS FOR TYGART RESERVOIR
STORET CODE 5404

PARAMETER	1ST SAMPLING (4/23/73) 3 SITES RANGE	MEAN	MEDIAN	2ND SAMPLING (7/28/73) 3 SITES RANGE	MEAN	MEDIAN	3RD SAMPLING (10/ 5/73) 3 SITES RANGE	MEAN	MEDIAN
TEMP (C)	8.3 - 17.0	12.8	11.9	13.7 - 27.7	23.2	24.9	16.7 - 23.7	22.2	23.2
DISS OXY (MG/L)	9.3 - 11.1	10.6	10.7	0.3 - 8.1	6.0	7.4	0.4 - 8.6	7.0	7.4
CNDCTVY (MCROMO)	70. - 80.	74.	75.	66. - 138.	95.	97.	88. - 132.	120.	127.
PH (STAND UNITS)	5.8 - 6.7	6.5	6.6	5.8 - 6.8	6.3	6.1	6.2 - 7.0	6.5	6.4
TOT ALK (MG/L)	10. - 10.	10.	10.	10. - 18.	12.	10.	10. - 18.	12.	11.
TOT P (MG/L)	0.004 - 0.013	0.007	0.006	0.004 - 0.023	0.006	0.005	0.004 - 0.045	0.013	0.007
ORTHO P (MG/L)	0.002 - 0.008	0.005	0.005	0.002 - 0.012	0.003	0.003	0.003 - 0.009	0.006	0.006
NO2+NO3 (MG/L)	0.440 - 0.500	0.474	0.480	0.090 - 0.480	0.295	0.280	0.040 - 0.360	0.287	0.280
AMMONIA (MG/L)	0.020 - 0.070	0.037	0.030	0.030 - 0.620	0.099	0.040	0.060 - 0.590	0.111	0.080
KJEL N (MG/L)	0.200 - 0.600	0.270	0.200	0.200 - 0.900	0.276	0.200	0.200 - 0.900	0.289	0.200
INORG N (MG/L)	0.470 - 0.540	0.511	0.510	0.290 - 0.720	0.394	0.320	0.330 - 0.630	0.398	0.370
TOTAL N (MG/L)	0.640 - 1.080	0.743	0.690	0.440 - 0.990	0.571	0.540	0.470 - 0.940	0.577	0.550
CHLRPYL A (UG/L)	0.5 - 0.9	0.6	0.5	1.0 - 2.0	1.5	1.6	1.2 - 1.6	1.4	1.3
SECCHI (METERS)	0.9 - 3.7	2.2	2.1	2.9 - 3.5	3.2	3.1	3.7 - 4.0	3.8	3.8

B. Biological characteristics:

1. Phytoplankton -

Sampling Date	Dominant Genera	Algal Units per ml
04/23/73	1. Flagellates	104
	2. Dinobryon sp.	57
	3. Pennate diatoms	17
	4. Nitzschia sp.	13
	5. Navicula (?) sp.	10
	Other genera	11
	Total	212
07/28/73	1. Glenodinium sp.	69
	2. Centric diatoms	69
	3. Ankistrodesmus sp.	35
	4. Flagellates	35
	Total	208
10/05/73	1. Microcystis sp.	287
	2. Scenedesmus sp.	202
	3. Phormidium sp.	169
	4. Flagellates	118
	5. Nitzschia sp.	67
	Other genera	135
	Total	978

2. Chlorophyll a -

Sampling Date	Station Number	Chlorophyll a (µg/l)
04/23/73	01	0.9
	02	0.5*
	03	0.5*
07/28/73	01	2.0
	02	1.0
	03	1.6
10/05/73	01	1.3
	02	1.6
	03	1.2

* Value known to be less than indicated.

C. Limiting Nutrient Study:

1. Autoclaved, filtered, and nutrient spiked -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.005	0.420	0.1
0.050 P	0.055	0.420	11.0
0.050 P + 1.0 N	0.055	1.420	14.8
1.0 N	0.005	1.420	0.1

2. Discussion -

The control yield of the assay alga, Selenastrum capricornutum, indicates that the potential primary productivity of Tygart Reservoir was low at the time the sample was collected (04/23/73). The yield increased significantly when orthophosphorus alone was added, but the addition of nitrogen alone had no effect on yield. Phosphorus is thus indicated as the limiting nutrient.

Phosphorus limitation is also indicated by the high mean ratios of inorganic nitrogen to orthophosphorus measured in the reservoir (55 to 1 or greater at all sampling stations and times).

IV. NUTRIENT LOADINGS
(See Appendix E for data)

For the determination of nutrient loadings, the West Virginia National Guard collected monthly near-surface grab samples from each of the tributary sites indicated on the map (page vi), except for the high runoff months of February and March when two samples were collected. Sampling was begun in July, 1973, and was completed in June, 1974.

Through an interagency agreement, stream flow estimates for the year of sampling and a "normalized" or average year were provided by the West Virginia District Office of the U.S. Geological Survey for the tributary sites nearest the lake.

In this report, nutrient loads for sampled tributaries were determined by using a modification of a U.S. Geological Survey computer program for calculating stream loadings*. Nutrient loads shown are those measured minus point-source loads, if any.

Nutrient loads for unsampled "minor tributaries and immediate drainage "("ZZ" of U.S.G.S.) were estimated using the means of the nutrient loads, in $kg/km^2/year$, at stations C-1, D-1, E-1, F-1, G-1, and H-1 and multiplying the means by the ZZ area in km^2.

The operator of the Elkins wastewater treatment plant provided monthly effluent samples and corresponding flow data. However, the operator of the Philippi plant submitted only two samples, and the operator of the Belington plant did not provide sufficient flow data

* See Working Paper No. 175.

to permit calculation of the effluent loads. Consequently, the nutrient loads from these two sources were estimated at 1.134 kg P and 3.401 kg N/capita/year, and flows were estimated at 0.3785 m^3/capita/day.

Also, the Elkins plant is not included as a point source in this report since it is located so far upstream from the reservoir (the sampling data are included in Appendix E for the record, however).

A. Waste Sources:

1. Known municipal* -

Name	Pop. Served	Treatment	Mean Flow (m^3/d)	Receiving Water
Philippi	3,200	prim. clarifier	1,211.2	Tygart Valley River
Belington	1,500	oxidation ditch	567.8	Tygart Valley River

2. Known industrial - None

* Leon, 1973.

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

Source	kg P/ yr	% of total
a. Tributaries (non-point load) -		
Tygart Valley River	26,615	55.3
Scab Run	495	1.0
Frog Run	140	0.3
Swamp Run	295	0.6
Sandy Creek	1,455	3.0
Teter Creek	1,435	3.0
Laurel Creek	1,080	2.3
Pleasant Creek	620	1.3
b. Minor tributaries & immediate drainage (non-point load) -	10,490	21.8
c. Known municipal STP's -		
Philippi	3,630	7.5
Belington	1,700	3.5
d. Septic tanks* -	15	<0.1
e. Known industrial - None	-	-
f. Direct precipitation** -	125	0.3
Total	48,095	100.0

2. Outputs -

Lake outlet - Tygart Valley R. 43,935

3. Net annual P accumulation - 4,160 kg.

* Estimate based on 61 lakeshore dwellings: see Working Paper No. 175.
** See Working Paper No. 175.

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

Source	kg N/ yr	% of total
a. Tributaries (non-point load) -		
Tygart Valley River	897,575	63.3
Scab Run	3,625	0.3
Frog Run	2,615	0.2
Swamp Run	6,385	0.5
Sandy Creek	73,255	5.2
Teter Creek	55,935	3.9
Laurel Creek	52,085	3.7
Pleasant Creek	18,075	1.3
b. Minor tributaries & immediate drainage (non-point load) -	283,825	20.0
c. Known municipal STP's -		
Philippi	10,885	0.8
Belington	5,100	0.4
d. Septic tanks* -	650	<0.1
e. Known industrial - None	-	-
f. Direct precipitation** -	7,645	0.5
Total	1,417,655	100.0

2. Outputs -

Lake outlet - Tygart Valley R.	1,507,515

3. Net annual N loss - 89,860 kg.

* Estimate based on 61 lakeshore dwellings; see Working Paper No. 175.
** See Working Paper No. 175.

D. Mean Annual Non-point Nutrient Export by Subdrainage Area:

Tributary	kg $P/km^2/yr$	kg $N/km^2/yr$
Tygart Valley River	11	367
Scab Run	115	843
Frog Run	41	769
Swamp Run	30	658
Sandy Creek	7	354
Teter Creek	10	404
Laurel Creek	8	372
Pleasant Creek	19	554

E. Yearly Loadings:

In the following table, the existing phosphorus loadings are compared to those proposed by Vollenweider (Vollenweider and Dillon, 1974). Essentially, his "dangerous" loading is one at which the receiving water would become eutrophic or remain eutrophic; his "permissible" loading is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A mesotrophic loading would be considered one between "dangerous" and "permissible".

Note that Vollenweider's model may not be applicable to water bodies with short hydraulic retention times.

	Total Phosphorus		Total Nitrogen	
	Total	Accumulated	Total	Accumulated
grams/m^2/yr	6.79	0.59	200.2	loss*

Vollenweider phosphorus loadings ($g/m^2/yr$) based on mean depth and mean hydraulic retention time of Tygart Reservoir:

"Dangerous" (eutrophic loading)	3.36
"Permissible" (oligotrophic loading)	1.68

* There was an apparent loss of nitrogen during the sampling year. This may have been due to nitrogen fixation in the lake, solubilization of previously sedimented nitrogen, recharge with nitrogen-rich ground water, or unknown and unsampled point sources discharging directly to the lake. Whatever the cause, a similar loss of nitrogen has occurred at Shagawa Lake, Minnesota, which has been intensively studied by EPA's Eutrophication and Lake Restoration Branch (Malueg et al., 1975).

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VI. APPENDICES

APPENDIX A

LAKE RANKINGS

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LAKES RANKED BY INDEX NOS.

RANK	LAKE CODE	LAKE NAME	INDEX NO
1	5404	TYGART RESERVOIR	450
2	5402	LAKE LYNN RESERVOIR	350
3	5403	SUMMERSVILLE RESERVOIR	299
4	5401	BLUESTONE RESERVOIR	100

LAKE DATA TO BE USED IN RANKINGS

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	SOC-MEAN SEC	MEAN CHLORA	1S-MIN DO	MEDIAN DISS ORTHO P
5401	BLUESTONE RESERVOIR	0.074	1.080	473.700	14.900	11.800	0.018
5402	LAKE LYNN RESERVOIR	0.006	0.490	403.222	4.733	14.800	0.003
5403	SUMMERSVILLE RESERVOIR	0.011	0.660	363.818	6.242	14.600	0.006
5404	TYGART RESERVOIR	0.006	0.430	378.667	1.178	14.700	0.005

PERCENT OF LAKES WITH HIGHER VALUES (NUMBER OF LAKES WITH HIGHER VALUES)

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	EGG-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P	INDEX NO
5401	BLUESTONE RESERVOIR	0 (0)	0 (0)	0 (0)	0 (0)	100 (3)	0 (0)	100
5402	LAKE LYNN RESERVOIR	33 (2)	67 (2)	33 (1)	67 (2)	0 (0)	100 (3)	300
5403	SUMMERSVILLE RESERVOIR	33 (1)	33 (1)	100 (3)	33 (1)	67 (2)	33 (1)	299
5404	TYGART RESERVOIR	83 (2)	100 (3)	67 (2)	100 (3)	33 (1)	67 (2)	450

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APPENDIX B

CONVERSION FACTORS

CONVERSION FACTORS

Hectares x 2.471 = acres

Kilometers x 0.6214 = miles

Meters x 3.281 = feet

Cubic meters x 8.107×10^{-4} = acre/feet

Square kilometers x 0.3861 = square miles

Cubic meters/sec x 35.315 = cubic feet/sec

Centimeters x 0.3937 = inches

Kilograms x 2.205 = pounds

Kilograms/square kilometer x 5.711 = lbs/square mile

APPENDIX C

TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR WEST VIRGINA 3/25/75

LAKE CODE 5404 TYGART RESERVOIR

TOTAL DRAINAGE AREA OF LAKE(SQ KM) 3537.9

TRIBUTARY	SUB-DRAINAGE AREA(SQ KM)	NORMALIZED FLOWS(CMS) JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
5404A1	3537.9	112.70	127.14	152.34	85.23	69.09	49.55	31.71	40.49	25.77	29.45	56.35	95.71	72.72
5404A2	2447.5	83.25	91.18	82.12	77.87	57.77	33.98	24.07	24.07	11.61	16.14	35.68	66.54	50.14
5404B1	4.3	0.17	0.17	0.20	0.14	0.11	0.06	0.06	0.03	0.03	0.03	0.06	0.14	0.10
5404C1	3.4	0.11	0.14	0.17	0.11	0.08	0.06	0.03	0.03	0.03	0.03	0.06	0.11	0.08
5404D1	9.7	0.34	0.40	0.45	0.31	0.23	0.14	0.11	0.08	0.05	0.06	0.14	0.28	0.22
5404E1	207.2	7.65	8.21	9.91	7.08	3.68	2.97	1.98	1.56	0.85	1.42	3.11	5.66	4.49
5404F1	138.6	5.10	5.66	6.51	4.81	3.40	1.98	1.27	0.99	0.57	0.99	1.98	3.96	3.09
5404G1	140.1	5.10	5.66	6.51	4.81	3.40	1.98	1.42	0.99	0.57	0.99	1.98	3.96	3.10
5404H1	32.6	1.13	1.27	1.56	1.13	0.85	0.42	0.28	0.25	0.14	0.23	0.42	0.99	0.72
5404Z2	554.3	17.56	19.82	23.79	13.31	10.76	7.65	5.10	6.23	3.96	4.53	8.78	15.01	11.34

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 3537.9
SUM OF SUB-DRAINAGE AREAS = 3537.7

TOTAL FLOW IN = 882.90
TOTAL FLOW OUT = 875.56

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
5404A1	7	73	9.40	28	8.72				
	8	73	26.22	18	54.93				
	9	73	23.59	15	26.11				
	10	73	39.64	23	36.53				
	11	73	97.69	16	65.41				
	12	73	183.49	21	236.16				
	1	74	209.83	18	288.83				
	2	74	108.74	12	99.11	24	89.76		
	3	74	110.15	15	120.06	30	71.64		
	4	74	75.89	29	13.11				
	5	74	53.24	20	18.63				
	6	74	167.64	28	198.78				
5404A2	7	73	7.93	28	17.84				
	8	73	20.67	18	58.90				
	9	73	10.62	17	4.20				
	10	73	25.80	23	5.45				
	11	73	80.99	25	35.11				
	1	74	134.79	13	247.21	27	101.37		
	2	74	84.38	11	64.56	24	81.27		
	3	74	93.16	10	95.43	30	31.43		
	4	74	75.89	21	30.02				
	5	74	49.84	20	30.02				
	6	74	117.23	16	13.03				

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TRIBUTARY FLOW INFORMATION FOR WEST VIRGINA 3/25/75

LAKE CODE 5404 TYGART RESERVOIR

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
5404B1	7	73	0.01	28	0.01				
	8	73	0.05	18	0.20				
	9	73	0.03	15	0.02				
	10	73	0.04	23	0.01				
	11	73	0.11	16	0.15				
	12	73	0.18	21	0.51				
	1	74	0.15	18	0.13				
	2	74	0.13	11	0.09	26	0.10		
	3	74	0.15	15	0.07	30	0.07		
	4	74	0.13	29	0.04				
	5	74	0.05	20	0.03				
	6	74	0.19	28	0.03				
5404C1	7	73	0.01	28	0.01				
	8	73	0.04	18	0.16				
	9	73	0.02	15	0.02				
	10	73	0.03	23	0.01				
	11	73	0.09	16	0.12				
	12	73	0.14	21	0.48				
	1	74	0.12	18	0.10				
	2	74	0.10	11	0.07	26	0.06		
	3	74	0.11	15	0.06	30	0.05		
	4	74	0.10	29	0.03				
	5	74	0.03	20	0.03				
	6	74	0.15	28	0.02				
5404D1	7	73	0.03	28	0.02				
	8	73	0.11	18	0.45				
	9	73	0.06	15	0.05				
	10	73	0.09	23	0.02				
	11	73	0.25	16	0.34				
	12	73	0.42	21	1.42				
	1	74	0.34	18	0.28				
	2	74	0.28	11	0.20	26	0.18		
	3	74	0.34	15	0.17	30	0.15		
	4	74	0.28	29	0.10				
	5	74	0.10	20	0.07				
	6	74	0.42	28	0.06				
5404E1	7	73	0.99	28	1.70				
	8	73	1.84	18	7.93				
	9	73	1.42	15	1.84				
	10	73	3.11	23	1.13				
	11	73	7.65	16	9.06				
	12	73	9.06	21	29.73				
	1	74	7.36	18	7.08				
	2	74	6.51	11	5.66	26	4.25		
	3	74	7.08	15	5.66	30	3.68		
	4	74	6.23	29	2.27				
	5	74	2.27	20	1.70				
	6	74	9.06	28	1.42				

TRIBUTARY FLOW INFORMATION FOR WEST VIRGINA 3/25/75

LAKE CODE 5404 TYGART RESERVOIR

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
5404F1	7	73	0.71	28	1.13				
	8	73	1.84	18	5.95				
	9	73	0.85	17	0.57				
	10	73	2.12	21	0.85				
	11	73	5.10	25	2.55				
	1	74	8.50	13	16.99	27	7.08		
	2	74	4.25	11	3.96	24	2.55		
	3	74	4.81	10	4.53	30	2.55		
	4	74	4.25	21	1.70				
	5	74	4.25	5	4.53				
	6	74	7.08	16	1.42				
5404G1	7	73	0.71	28	1.13				
	8	73	1.84	18	6.23				
	9	73	0.85	17	0.57				
	10	73	2.12	21	0.85				
	11	73	5.10	25	2.55				
	1	74	8.50	13	16.99	27	7.08		
	2	74	4.25	11	3.96	24	2.55		
	3	74	4.81	10	5.10	30	2.55		
	4	74	4.25	21	1.70				
	5	74	4.25	5	4.53				
	6	74	7.08	16	1.42				
5404H1	7	73	0.08	28	0.07				
	8	73	0.37	18	1.53				
	9	73	0.20	17	0.06				
	10	73	0.31	21	0.06				
	11	73	0.85	25	0.40				
	1	74	1.13	13	2.10	27	0.85		
	2	74	0.99	11	0.68	24	0.57		
	3	74	1.10	10	0.82	30	0.48		
	4	74	0.96	21	0.37				
	5	74	0.34	5	0.48				
	6	74	1.44	16	0.24				

APPENDIX D

PHYSICAL and CHEMICAL DATA

STORET RETRIEVAL DATE 75/03/25

540401
39 18 40.0 080 02 00.0
TYGART RESERVOIR
54091 WEST VIRGINIA

11EPALES
3

2111202
0104 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/04/23	12 55	0000	16.6		36							
	12 55	0006	16.0	10.3		70	6.60	10K	0.040	0.400	0.500	0.008
	12 55	0015	15.5	10.3		70	6.70	10K	0.030	0.200	0.490	0.006
	12 55	0022	13.1	10.8		70	6.70	10K	0.030	0.200K	0.490	0.005
	12 55	0035	11.9	10.9		70	6.70	10K	0.040	0.200K	0.470	0.005
	12 55	0050	11.1	11.1		70	6.70	10K	0.030	0.200K	0.470	0.006
	12 55	0067	10.4	11.0		70	6.70	10K	0.030	0.200K	0.460	0.005
	12 55	0087	9.7	11.1		70	6.70	10K	0.040	0.200K	0.470	0.005
	12 55	0107	8.3	11.1		80	6.70	10K	0.060	0.200K	0.480	0.005
73/07/28	14 35	0000	27.6		138	96	6.80	17	0.040	0.200	0.280	0.003
	14 35	0005	27.5	7.8		97	6.70	18	0.040	0.400	0.280	0.003
	14 35	0025	26.4	7.8		97	6.50	18	0.030	0.200K	0.280	0.002K
	14 35	0045	23.1	7.5		80	6.20	18	0.040	0.200K	0.330	0.003
	14 35	0070	18.9	8.1		71	6.10	18	0.050	0.200K	0.370	0.003
	14 35	0100	16.7	4.1		66	5.90	10K	0.030	0.200K	0.480	0.002K
	14 35	0125	13.7	0.4		70	5.80	10K	0.360	0.400	0.360	0.003
73/10/05	12 55	0000	23.7		156	127	6.60	11	0.110	0.500	0.270	0.008
	12 55	0005	23.5	7.6		127	6.40	10	0.080	0.300	0.270	0.007
	12 55	0015	23.4	7.2		127	6.30	10	0.090	0.200K	0.270	0.005
	12 55	0025	22.8	6.2		132	6.20	12	0.120	0.200	0.280	0.003
	12 55	0050	21.6	6.4		120	6.20	13	0.130	0.300	0.340	0.007
	12 55	0080	20.4	7.6		105	6.40	10	0.100	0.300	0.360	0.009
	12 55	0114	16.7	0.4		88	6.20	18	0.590	0.900	0.040	0.006

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/03/25

540401
39 18 40.0 080 02 00.0
TYGART RESERVOIR
54091 WEST VIRGINIA

11EPALES 2111202
3 0104 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/04/23	12 55	0000		0.9
	12 55	0006	0.007	
	12 55	0015	0.006	
	12 55	0022	0.008	
	12 55	0035	0.006	
	12 55	0050	0.006	
	12 55	0067	0.004	
	12 55	0087	0.006	
	12 55	0107	0.006	
73/07/28	14 35	0000	0.005	2.0
	14 35	0005	0.005	
	14 35	0025	0.005	
	14 35	0045	0.005	
	14 35	0070	0.005	
	14 35	0100	0.006	
	14 35	0125	0.007	
73/10/05	12 55	0000	0.008	1.3
	12 55	0005	0.007	
	12 55	0015	0.005	
	12 55	0025	0.005	
	12 55	0050	0.013	
	12 55	0080	0.022	
	12 55	0114	0.023	

STORET RETRIEVAL DATE 75/03/25

540402
39 16 24.0 080 00 49.0
TYGART RESERVOIR
54091 WEST VIRGINIA

11EPALES 2111202
3 0085 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/04/23	13 50	0000	15.7		84	75	6.60	10K	0.030	0.400	0.490	0.006
	13 50	0006	15.5	10.0		75	6.60	10K	0.020	0.600	0.480	0.004
	13 50	0015	15.0	10.2		75	6.60	10K	0.030	0.300	0.490	0.002K
	13 50	0021	13.6	10.5		70	6.60	10K	0.030	0.300	0.500	0.004
	13 50	0041	11.4	11.1		75	6.60	10K	0.030	0.200	0.470	0.004
	13 50	0061	10.1	11.0		75	6.60	10K	0.040	0.200	0.470	0.003
	13 50	0081	9.3	10.6		75	6.60	10K	0.070	0.300	0.460	0.005
73/07/28	15 20	0000	27.2		116	105	6.70	10K	0.040	0.200K	0.270	0.003
	15 20	0005	27.0	7.8		105	6.70	10K	0.040	0.200K	0.270	0.003
	15 20	0025	26.4	7.4		138	6.10	10K	0.060	0.200K	0.240	0.002K
	15 20	0045	22.8	7.6		74	6.20	10K	0.050	0.200K	0.340	0.002
	15 20	0070	18.9	7.8		69	6.10	10K	0.040	0.200K	0.360	0.002
	15 20	0092	17.4	2.9		67	5.90					
73/10/05	13 20	0000	23.4		150	127	6.60	10K	0.080	0.400	0.270	0.004
	13 20	0005	23.5	7.6		128	6.50	10K	0.080	0.200	0.280	0.004
	13 20	0015	23.3	7.2		127	6.40	10K	0.090	0.200K	0.280	0.004
	13 20	0025	23.2	7.4		128	6.40	11	0.070	0.200K	0.280	0.005
	13 20	0050	21.9	7.4		119	6.30	11	0.080	0.200K	0.340	0.007
	13 20	0088	20.1	8.0		109	6.70	15	0.080	0.300	0.350	0.006

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/03/25

540402
39 16 24.0 080 00 49.0
TYGART RESERVOIR
54091 WEST VIRGINIA

11EPALES 2111202
3 0085 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/04/23	13 50	0000	0.006	0.5K
	13 50	0006	0.004	
	13 50	0015	0.006	
	13 50	0021	0.009	
	13 50	0041	0.008	
	13 50	0061	0.007	
	13 50	0081	0.007	
73/07/28	15 20	0000	0.005	1.0
	15 20	0005	0.005	
	15 20	0025	0.005	
	15 20	0045	0.005	
	15 20	0070	0.004	
73/10/05	13 20	0000	0.005	1.6
	13 20	0005	0.004	
	13 20	0015	0.004	
	13 20	0025	0.005	
	13 20	0050	0.011	
	13 20	0088	0.045	

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/03/25

540403
39 16 03.0 079 57 38.0
TYGART RESERVOIR
54091 WEST VIRGINIA

11EPALES 2111202
3 0077 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/04/23	14	20 0000			144	80	5.80	10K	0.040	0.200	0.440	0.004
	14	20 0006	17.0	9.3		75	6.10	10K	0.030	0.200K	0.440	0.005
	14	20 0015	16.9	9.8		80	6.20	10K	0.030	0.200K	0.440	0.007
	14	20 0022	12.3	10.5		75	6.30	10K	0.040	0.300	0.470	0.007
	14	20 0030	11.7	10.7		75	6.40	10K	0.040	0.300	0.480	0.007
	14	20 0040	11.4	10.8		75	6.50	10K	0.030	0.300	0.480	0.004
	14	20 0055	11.3	10.9		75	6.50	10K	0.040	0.200	0.480	0.002
	14	20 0073	11.1	10.7		75	6.50	10K	0.050	0.400	0.480	0.004
73/07/28	17	00 0000	27.7		124	130	6.60	10K	0.050	0.200K	0.250	0.002
	17	00 0005	27.5	7.7		126	6.50	10K	0.040	0.300	0.250	0.002K
	17	00 0025	26.8	7.4		128	6.10	10K	0.050	0.200K	0.240	0.004
	17	00 0050	23.4	5.6		101	5.90	10K	0.110	0.300	0.320	0.003
	17	00 0075	18.4	0.3		83	6.00	11	0.620	0.900	0.090	0.012
73/10/05	13	55 0000	23.6		144	127	6.30	11	0.070	0.300	0.280	0.008
	13	55 0005	23.4	7.4		128	6.50	11	0.070	0.200K	0.280	0.008
	13	55 0015	23.3	7.4		127	6.40	10	0.060	0.200K	0.270	0.005
	13	55 0030	23.0	7.5		123	6.40	10K	0.070	0.200K	0.290	0.006
	13	55 0050	20.7	8.4		102	7.00	13	0.060	0.200	0.350	0.007
	13	55 0064	20.4	8.6		101	7.00	14	0.070	0.200	0.360	0.007

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/03/25

540403
39 16 03.0 079 57 38.0
TYGART RESERVOIR
54091 WEST VIRGINIA

11EPALES 2111202
3 0077 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/04/23	14 20	0000	0.005	0.5K
	14 20	0006	0.006	
	14 20	0015	0.006	
	14 20	0022	0.008	
	14 20	0030	0.009	
	14 20	0040	0.010	
	14 20	0055	0.009	
	14 20	0073	0.013	
73/07/24	17 00	0000	0.006	1.6
	17 00	0005	0.005	
	17 00	0025	0.004	
	17 00	0050	0.005	
	17 00	0075	0.023	
73/10/05	13 55	0000	0.008	1.2
	13 55	0005	0.007	
	13 55	0015	0.005	
	13 55	0030	0.007	
	13 55	0050	0.026	
	13 55	0064	0.034	

K VALUE KNOWN TO BE
LESS THAN INDICATED

APPENDIX E

TRIBUTARY and WASTEWATER TREATMENT PLANT DATA

STORET RETRIEVAL DATE 75/03/25

3404A1
39 19 14.0 080 01 32.0
TYGART VALLEY RIVER
54057 7.5 GRAFTON
O/TYGART RES
USGS GAUGING STATION DOWNSTREAM OF DAM
11PALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/07/24	16	00	0.420	0.210	0.080	0.005K	0.015
73/08/14	11	35	0.360	0.110	0.060	0.024	
73/09/15	11	30	0.300	0.340	0.132	0.005K	0.015
73/10/23	11	20	0.280	0.250	0.095	0.018	0.018
73/11/16	10	00	0.370	0.100K	0.063	0.005K	0.005K
73/12/21	11	15	0.620	0.300	0.052	0.016	0.065
74/01/16	10	20	0.490	0.100	0.036	0.005	0.055
74/02/12	12	10	0.490	0.200	0.040	0.005	0.005K
74/02/24	13	40	0.410	0.100K	0.030	0.005K	0.015
74/03/15	11	30	0.420	0.600	0.065	0.005K	0.005K
74/03/30	11	55	0.410	0.700	0.080	0.005K	0.005K
74/04/29	11	30	0.360	0.400	0.055	0.005K	0.010
74/05/20	11	25	0.260	0.100K	0.050	0.002	0.005K
74/06/26	12	00	0.310	0.100K	0.057	0.005	0.030

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/03/25

3404A2
39 12 35.0 075 59 40.0
TYGART VALLEY RIVER
54 7.5 NESTORVILLE
1/TYGART RES
RD BRDG AT W EDGE OF ARDEN
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORT. O MG/L P	00665 PHOS-TOT MG/L P
73/07/28	10	45	0.390	0.210	0.044	0.005K	0.020
73/08/18	10	35	0.035	0.100K	0.076	0.009	0.009
73/09/17	11	40	0.115	0.210	0.050	0.011	0.015
73/10/23	11	00	0.208	0.250	0.052	0.013	
73/11/25	10	55	0.384	0.150	0.032	0.005K	0.035
74/01/13	10	30	0.570	0.100	0.020	0.005K	0.025
74/01/27	11	05	0.480	0.100	0.028	0.005K	0.010
74/02/11	14	20	0.480	0.100K	0.035	0.005	0.020
74/02/24	10	35	0.430	0.200	0.025	0.005K	0.030
74/03/10	10	00	0.440	0.200	0.040	0.010	0.030
74/03/30	09	45	0.400	0.900	0.072	0.005K	0.020
74/04/21	10	55	0.340	0.200	0.047	0.010	0.010
74/05/20	10	05	0.264	0.400	0.040	0.005K	0.017
74/06/16	09	40	0.280	0.100K	0.055	0.005K	0.020

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/03/25

5404B1
39 16 16.0 080 00 45.0
SCAM RUN
54 7.5 GRAFTON
T/TYGART RES
RD BRDG 2 MI S OF PARK VIEW
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/12/28	15 35		0.315	0.640	0.071	0.130	0.220
73/03/15	11 10		0.048	20.000	2.900	0.540	1.350
73/04/15	11 10		0.600	1.300	0.230	0.058	0.240
73/10/23	11 05		0.700	0.900	0.089	0.036	
73/11/16	10 15		0.200	0.250	0.026	0.008	0.015
73/12/21	11 00		0.500	0.100	0.020	0.008	0.025
74/01/18	10 13		0.330	1.300	0.100	0.008	0.015
74/02/11	12 00		0.352	0.100K	0.020	0.005	0.010
74/02/26	13 30		0.264	0.100K	0.010	0.010	0.030
74/03/15	11 20		0.232	0.200	0.020	0.010	0.015
74/03/30	11 40		0.152	0.700	0.025	0.005	0.035
74/04/24	11 15		0.200	1.000	0.045	0.010	0.010
74/05/20	11 15		0.112	3.100	0.150	0.007	0.035
74/06/24	11 40		0.168	1.000	0.070	0.020	0.065

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/03/25

3404C1
39 16 55.0 079 59 00.0
PROG RUN
34 7.5 THORNTON
T/TYGART RES
RD BRDG 3 MI S OF BLUEVILLE
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/07/24	15 15		1.020	0.450	0.198	0.092	0.115
73/08/18	10 55		0.450	0.320	0.096	0.048	0.050
73/09/15	10 55		0.940	1.290	0.075	0.023	0.190
73/10/23	10 52		0.420	0.500	0.150	0.030	0.175
73/11/16	10 25		0.310	0.300	0.017	0.008	0.020
73/12/21	10 45		0.672	0.200	0.020	0.012	0.030
74/01/18	10 05		0.490	0.100K	0.028	0.008	0.020
74/02/11	11 45		0.528	0.100K	0.046	0.010	0.015
74/02/25	13 20		0.470	0.400	0.090	0.010	0.030
74/03/15	11 10		0.340	0.300	0.025	0.005	0.015
74/03/30	11 30		0.300	0.700	0.025	0.005K	0.045
74/04/24	11 00		0.300	1.000	0.070	0.005	0.005K
74/05/20	11 05		0.352	0.300	0.060	0.010	0.045
74/06/24	11 30		0.240	0.700	0.035	0.010	0.030

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/03/25

340401
39 17 46.0 079 57 20.0
SWAMP RUN
54 7.5 THORNTON
T/TYGART RES
RD BRDG .5 MI SE OF MILLERTOWN
!!EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/07/28	14 55		0.280	0.600	0.110	0.021	0.055
73/08/18	10 40		0.231	0.310	0.098	0.020	0.040
73/09/15	10 40		1.800	3.700	0.560	0.132	0.525
73/10/23	10 40		0.310	0.550	0.083	0.023	0.180
73/11/16	10 45		0.399	0.450	0.063	0.008	0.040
73/12/21	10 35		0.650	0.300	0.020	0.008	0.035
74/01/18	09 50		0.570	1.700	0.136	0.008	0.030
74/02/11	11 35		0.588	0.100K	0.030	0.005	0.015
74/02/26	13 10		0.520	0.100	0.030	0.010	0.025
74/03/15	11 00		0.480	0.300	0.020	0.005K	0.025
74/03/30	11 15		0.300	0.300	0.015	0.005	0.025
74/04/24	10 50		0.208	0.700	0.150	0.010	0.010
74/05/20	10 55		0.200	0.300	0.050	0.007	0.045
74/06/28	11 15		0.330	0.700	0.065	0.005K	0.035

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/03/25

3404E1
39 17 10.0 079 56 00.0
SANDY CREEK
54 7.5 THORNTON
T/TYGART RES
RD BRDG IN VILLAGE OF HIRAM
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/07/28	14 40		0.280	0.340	0.153	0.007	0.007
73/08/14	10 25		0.336	0.230	0.110	0.006	0.005
73/09/15	10 25		0.180	0.180	0.120	0.009	0.020
73/10/23	10 30		0.280	0.250	0.078	0.012	
73/11/15	10 50		0.336	0.150	0.041	0.005K	0.010
73/12/21	10 25		0.520	0.300	0.032	0.005K	0.035
74/01/14	09 42		0.440	0.100K	0.052	0.005K	0.005
74/02/11	11 25		0.450	0.100K	0.030	0.005K	0.005
74/02/26	13 00		0.410	0.200	0.030	0.005	0.015
74/03/15	10 50		0.340	0.200	0.030	0.005K	0.005K
74/03/30	09 55		0.288	0.300	0.030	0.005K	0.005K
74/04/24	11 40		0.184	0.100	0.020	0.005K	0.010
74/05/20	10 45		0.160	0.100K	0.055	0.005K	0.005K
74/06/24	11 05		0.260	0.100K	0.050	0.005K	0.005K

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/03/25

3404F1
39 12 40.0 079 56 00.0
TETER CREEK
54 7.5 NESTORVILLE
T/TYGART RES
BANK BELO CONFLUENCE WITH GLADE RUN
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/07/26	11 30		0.154	0.170	0.026	0.006	0.010
73/08/16	11 05		0.170	0.100K	0.028	0.007	0.016
73/09/17	11 00		0.950	0.220	0.017	0.008	0.015
73/10/21	11 15		0.230	0.300	0.019	0.011	
73/11/25	11 27		0.276	0.100K	0.020	0.005K	0.015
74/01/13	11 00		0.460	0.100K	0.016	0.006	0.010
74/01/27	11 35		0.384	0.100K	0.016	0.005K	0.005K
74/02/11	14 45		0.410	0.100K	0.010	0.005K	0.010
74/02/24	11 06		0.352	0.400	0.025	0.005	0.015
74/03/10	10 25		0.340	0.200	0.010	0.005K	0.040
74/03/30	10 00		0.276	0.300	0.020	0.005K	0.015
74/04/21	11 25		0.224	0.300	0.020	0.005	0.010
74/05/05	09 40		0.240	0.200	0.035	0.003	0.015
74/06/16	10 05		0.300	0.500	0.025	0.005	

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/03/25

540461
39 11 50.0 079 58 43.0
LAUREL CREEK
54 7.5 NESTORVILLE
T/TYGART RES
RD BRDG 5 MI WSW OF MOATSVILLE
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/07/25	11 05		0.270	0.210	0.015	0.005K	0.005K
73/08/18	10 48		0.160	0.140	0.018	0.005K	0.005K
73/09/17	11 20		0.260	0.320	0.017	0.006	0.020
73/10/21	11 15		0.176	0.300	0.030	0.009	
73/11/25	11 10		0.192	0.100K	0.016	0.005K	0.010
74/01/13	10 45		0.384	0.100K	0.016	0.012	0.012
74/01/27	11 20		0.336	0.100K	0.016	0.005K	0.005K
74/02/11	14 30		0.368	0.100K	0.020	0.005K	0.005K
74/02/24	10 50		0.310	0.100K	0.010	0.005	0.015
74/03/10	10 10		0.260	0.200	0.025	0.005K	0.015
74/03/30	10 00		0.232	1.000	0.030	0.005	0.015
74/04/21	11 07		0.200	0.300	0.020	0.005K	0.010
74/05/05	09 50		0.138	0.200	0.035	0.005K	0.015
74/06/16	09 50		0.224	0.700	0.047	0.005K	

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/03/25

5404M1
39 14 50.0 080 01 25.0
PLEASANT CREEK
54 7.5 PHILLIPPI
T/TYGART RES
RD BRDG 9 MI N OF PHILLIPPI
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/07/24	10 10		0.032	0.440	0.078	0.006	0.025
73/08/16	10 05		0.064	0.440	0.093	0.007	0.020
73/09/17	12 05		0.010K	1.000	0.010	0.008	0.095
73/10/21	10 40		0.033	0.400	0.047	0.009	
73/11/25	10 35		0.192	0.100	0.044	0.005K	0.025
74/01/13	10 10		0.710	0.100K	0.016	0.008	0.020
74/01/27	10 40		0.450	0.200	0.024	0.005K	0.005K
74/02/11	14 00		0.510	0.100	0.100	0.005K	0.005K
74/02/24	10 10		0.440	0.100K	0.012	0.007	0.015
74/03/10	09 40		0.360	0.500	0.025	0.005K	0.025
74/03/30	09 20		0.288	0.800	0.040	0.005K	0.030
74/04/21	09 45		0.208	2.000	0.110	0.005K	0.025
74/05/05	10 22		0.132	0.400	0.040	0.005K	0.025
74/06/16	09 15		0.084	0.750	0.060	0.005K	0.040

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/03/25

5404AA PR5404AA P003200
39 09 20.0 080 02 40.0
PHILIPPI
54067 7.5 PHILIPPI
T/TYGART RESERVOIR
TYGART VALLEY RIVER
11EPALES 2141204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
73/08/28	10 00		0.176	0.200	0.176	0.056	0.085	0.251	0.489
73/09/28	10 00		0.780	0.800	0.670	0.040	0.395	0.450	0.194

STORET RETRIEVAL DATE 75/03/25

5404AB TF5404AB P006000
39 01 30.0 079 07 00.0
ELKINS
54 BARBOUR COUNTY
T/TYGART RESERVOIR
TYGART VALLEY RIVER
11EPALES 2141204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
73/09/19	07 00								
CP(T)-			1.900	11.500	2.700	3.780	7.100	1.000	0.800
73/09/19	19 00								
73/10/24	08 00								
CP(T)-			0.370	16.500	3.780	6.000	8.500	0.800	0.800
73/10/24	20 00								
73/12/03	07 00								
CP(T)-			0.500	12.500	2.100	2.900	6.200	1.750	1.200
73/12/03	17 00								
74/01/15	07 00								
CP(T)-			1.920	10.000	0.425	1.440	2.800	1.250	1.500
74/01/15	15 30								
74/02/18			1.680	7.400	0.830	3.110	4.400	1.320	1.430
74/04/24			0.640	17.000	1.500	1.900	6.600	1.430	1.600

STORET RETRIEVAL DATE 75/03/25

5404AC 0D5404AC P001500
38 55 30.0 079 52 30.0
BELINGTON
54 RANDOLPH COUNTY
T/TYGART RESERVOIR
TYGART VALLEY RIVER
11EPALES 2141204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
73/08/17	11 00		0.450	5.000	1.800	1.500	2.100		
73/09/07	09 00		1.100	12.500	5.900	3.700	4.500		
73/10/19	09 00		0.960	13.500	6.700	5.200	6.800		
73/11/21	11 00		0.190	9.600	4.700	3.300	4.100		
73/12/19	11 00		0.660	7.100	2.400	1.400	2.500		
74/01/18	10 00		1.000	7.600	3.200	2.080	3.800		
74/02/22	09 00		1.000	6.500	2.600	1.700	3.400		
74/03/23	11 00		0.840	6.000	2.200	1.000	2.400		
74/04/22	11 00		0.320	7.200	3.100	1.400	3.000		
74/09/06	09 30		2.300	4.000	2.400	1.350	1.600	0.335	
74/10/29	10 00		0.640	8.800	4.600	2.800	3.200		0.335